

Geology plays a crucial role in the ecology of Montgomery County, through its influence on landforms and on the natural of the soils. Montgomery contains parts of three of the major geologic divisions of North Carolina: Carolina Slate Belt, Triassic Basins, and Sandhills.

Most of the area of the county is in the Carolina Slate Belt (or Western Slate Belt), which runs throughout the middle of North Carolina. Rocks in this belt formed in a chain of volcanic islands that were separated from North America, and were later joined to the continent and folded up by continental collisions. The rocks were also metamorphosed by the pressure and heat of the collision, but to a lesser degree than most of the rocks in the Piedmont and Mountains. The original character of the rocks is therefore more visible, and most rocks are named for their original type. The rocks of this belt include a wide variety of volcanic rocks. Tuffs are rocks composed of volcanic ash or dust, some of which were welded together while still hot. There are also denser, harder beds formed by flows of liquid lava. The very hard flow rocks form most of the higher ridges, and the concentration of them in Montgomery and Stanley Counties is responsible for the rugged character of the Uwharrie Mountains. Variation in chemical composition of the volcanic rocks is important. The most common are felsic rocks, such as rhyolite. They have a chemical composition similar to granite, with large proportions of silicon, sodium, and potassium, and weather to very acidic soils. There are also extensive areas of mafic volcanic rocks, basalts, which are higher in iron, magnesium, and calcium, and weather to soils that are more fertile, less acidic, but higher in clay. A smaller group of volcanic rocks is intermediate between the felsic and mafic groups. These chemical variations in soils are important in determining what kinds of plants and natural communities occur in a place. The high clay content of soils weathered from mafic rocks is sometimes important in forming clay hardpans that support distinctive communities.

There are also large expanses of volcanic epiclastic rock in the Carolina Slate Belt, which are sedimentary rocks formed from materials eroded from fresh volcanic rocks. They vary in composition according to the material that formed them. There are also some areas of shale, siltstone, and muddy sandstone, known collectively as argillite and graywacke, formed from more typical sediments. The sedimentary rocks form areas of more subdued topography. Some of the sedimentary rocks form unusually silty or clayey soils which produce areas of acidic seepage that are habitat for rare communities.

The Triassic Basin areas in the southern part of the county also contain sedimentary rocks, but ones of a different character. The basins were formed by continental rifting during the Triassic Period, well after the volcanic activity and metamorphism had ended. Erosion of the adjacent higher areas filled the basins with gravel, sand, and clay, which became the soft rocks present in these areas today. Because the Triassic sedimentary rocks are not metamorphosed and are not well consolidated, they produce areas of low land, with wide stream valleys. Within the Triassic Basin areas, and to some extent elsewhere in the county, are diabase dikes. Diabase is a mafic rock that formed from magma intruded into cracks in other rock. Like other mafic rocks, it is high in iron, magnesium, and calcium, and forms rich but clayey soils that can support distinctive plants. Diabase is harder than the Triassic sedimentary rocks. The dikes, vertical slabs of rock that have linear outcrops on the surface, form several prominent ridges in the southern part of the county.